

16. A method for monitoring a position of a mobile communication terminal as claimed in claim 9, the method further comprising the step of transmitting a position information item by Unstructured Supplementary Service Data.

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17. A method for monitoring a position of a mobile communication terminal as claimed in claim 9, the method further comprising the step of transmitting a position information item by Short Message Service.

#### REMARKS

10 The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby.

15 Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Versions with Markings to Show Changes Made."**

20 In addition, the present amendment cancels original claims 1-8 in favor of new claims 9-17. Claims 9-17 have been presented solely because the revisions by crossing out underlining which would have been necessary in claims 1-8 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-8 does not constitute an intent on the part  
25 of the Applicants to surrender any of the subject matter of claims 1-8.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Description

SPECIFICATION

- 5      ~~Method for monitoring the position of a mobile communication terminal for  
location dependent telecommunication services and an active voice connection~~

TITLE OF THE INVENTION

"METHOD FOR MONITORING

THE POSITION OF A MOBILE COMMUNICATION

- 10      TERMINAL FOR LOCATION DEPENDENT TELECOMMUNICATION  
SERVICES AND AN ACTIVE VOICE CONNECTION"

BACKGROUND OF THE INVENTION

~~Technical field of the invention~~

- 15      Location dependent telecommunication services (*Location Dependent  
Services*) are becoming more and more significant in mobile radio networks.

A known technology for implementing such and other telecommunication services in telecommunication networks, in particular in the mobile radio network, is the "Intelligent Network" IN, which is known to the person skilled in the art through ITU publications (Q.1200 ff) and ETSI standards.

- 20      For calls originating from a mobile terminal (Mobile Originating Call, MOC), only the location of the mobile terminal (Mobile Station, MS) when the connection is set up is currently assessed.

- 25      In this context, the location of the terminal can, up to until now, be established in the manner below. The message IDP (INAP Operation Initial DP) to the service center contains a location information item (*LocationInformation*) which contains the number (*LocationNumber*) of that radio cell (*serving cell*) in a mobile radio network which is originally used to set up the call. If the service customer moves into another cell (handover), the service center (for example, the SCP, Service Control Point) is given no kind of indication about the change of location.

The consequence for a service and, by way of example, its specific billing (Home Zone Billing, HZB), depending on the location, is as follows: if the service customer starts a telephone call within a privileged radio cell (Home Zone), the call is billed at a cheaper rate. This situation also does not change if he/she leaves this  
5 radio cell (Home Zone), however. The service provider wants the service customer to telephone at a cheaper rate only within he/she own radio cell(s) (Home Zone), but at the normal mobile radio tariffs outside this (these) radio cell(s).

The same applies for the opposite direction: if the service customer starts a telephone call outside his/her Home Zone and enters his/her Home Zone during the  
10 call, then his/her telephone call is billed at the higher rate in his/her Home Zone too.

The same problem also arises when the customer using the location dependent service, which uses this billing model, for example, is called (Mobile Terminating Call, MTC).

This concerns all the position-dependent characteristics of a  
15 telecommunication service; for example, including access authorizations to particular services, restrictions on service characteristics in particular radio cells, etc.

#### **Prior art**

Techniques for position finding are already known. Delay time  
20 measurements can be used to establish the location of the mobile terminal with an accuracy of approximately 100 meters (*Time Of Arrival TOA, Enhanced Observed Time Difference E-OTD*). The use of a radio-assisted global positioning system (GPS) is also known.

Both solutions are complex and cost intensive. They also provide much  
25 more accurate position details than are needed for the telecommunication services described.

It is an object of the present invention to specify a method which permits sufficiently accurate position finding for a mobile terminal during a call and, at the same time, avoids the drawbacks cited above.

30 **Description of the invention**

~~This object is achieved by a method in accordance with patent claim 1.~~  
~~In this context, an extension is described below for telecommunication services~~  
~~(MOC and MTC).~~

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#### SUMMARY OF THE INVENTION

The A key feature ~~fundamental to~~ of the present invention is that the telecommunication service, which can be activated by the A-party (that is to say, by the calling party, MOC) or by the B-party (that is to say, by the called party, MTC), is location dependent. ~~This may mean that it is~~ As such, it may be subject to  
10 different billing models, or else that other service features (Features) may differ depending on location.

To guarantee that the telecommunication service works correctly during a call, the position of the terminal in question needs to be checked not only when the connection is set up but also over the entire duration of the active connection. If a  
15 change of position is established, the telecommunication service then needs to be changed in a corresponding manner by the service center; that is to say, a change to the billing model used, for example.

Once the telecommunication service becomes aware of the changes of position, the service center (for example, the SCP in an IN) can then react to the  
20 change during the call, a service characteristic which has not been available to date.

The An advantage over "Time Of Arrival" (TOA) and "Enhanced Observed Time Difference" (E-OTD) is that the technology available in the network is used. The solution presented in this case is simpler to implement, even if it is not as  
25 accurate.

~~Advantageous refinements and developments are specified in the subclaims.~~

The inventive method is particularly advantageous when a special billing model is used in which the charges incurred are dependent on which subscriber is involved and what his current position is.

30 The change of position can, in principle, be initiated:

- via the terminal:

In one preferred embodiment, the terminal reports its position to the service center. This can be done whenever the terminal establishes a (significant) change of position or else at regular intervals and also a combination of the two.

- via the service center:

In another embodiment, the position of the terminal is requested by the service center. This can be done at regular intervals.

10 In this context, the position information item transmitted from the communication terminal to the service center may be in any format. If it is not in the format used by the service center, the service center needs to convert it into suitable position information after reception.

15 The regularity and the intervals with/at which position information is transmitted can be chosen as appropriate by the person skilled in the relevant art.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

#### **Brief description of the drawings**

#### 20 BRIEF DESCRIPTION OF THE FIGURES

~~The invention is explained below using exemplary embodiments, where~~

Figure 1 shows a schematic illustration of a mobile radio network of cellular design and a terminal whose position within the mobile radio network changes during a call.

25 ~~Figure 2 shows a solution variant initiated by the SCP, and~~

~~Figure 3 shows a solution variant initiated by the terminal.~~

#### **Description of the preferred embodiments**

#### DETAILED DESCRIPTION OF THE INVENTION

30 Figure 1 shows a mobile radio network of cellular design containing a few radio cells FZ1, FZ2, FZ3 and FZ4. Each radio cell contains apparatuses H-BSC,

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V-BSC, illustrated by triangles, which control the radio traffic for the cell in question. These apparatuses are connected to a central controller MSC which has access to subscriber registers HLR and VLR. These techniques are known to the person skilled in the art of GSM (Global System for Mobile Communication) technology, but other cellular radio networks such as PCN (Personal Communication Network) or the like are also conceivable.

5 A subscriber in this mobile radio network now uses his/her terminal MT (Mobile Terminal) to dial another subscriber number and, thus, obtains a connection to the network in his/her radio cell FZ1. The location of the second subscriber B-Party and his/her exchange M-SSP are not relevant to the inventive method.

This radio cell is linked to a particular characteristic in the service center. This may be a particular billing system referred to by the operator as the Home Zone, and this connection is thus billed using a separate billing model.

15 If the subscriber now moves, leaves the Home Zone and enters the neighboring radio cell FZ3, the central controller is informed about this change of position, as shown in ~~the two subsequent figures~~ Figures 2 and 3.

The position is transmitted to the service center during the telephone call ~~by means of~~ via additional *Unstructured Supplementary Service Data* USSD and SIM toolkit, for example. In this context, location information available in MT and/or location changes are transmitted. Parameters which are available are, by way of example, "Location Area Identity" (LAI), "Serving Cell ID" and "Serving Cell Channel".

Two solution variants can be envisaged:

- 25 • SCP initiates: Figure 2. The IN service logic in the service control center SCP asks at service-specific time intervals whether the telephoning subscriber A-Party has moved (- this allows the service provider to keep the signaling load under control). To this end, the SCP sends the IN customer a request USSD Request (to the Calling Party Address CgPA in the case of MOC services, to the Called Party Address
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CdPA in the case of MTC services) which tells the SIM toolkit of the MS to respond with a USSD Response containing location information and/or location changes.

- 5           •       MS initiates: Figure 3. In the event of handover, the MT uses the SIM toolkit to inform the service center SCP via USSD Request that it has moved. Even within an enclosed space, handover frequently occurs if an adjacent cell has a better signal strength; ~~in~~. In this case, however, there has been no change of location relevant to the service provider. To
- 10       prevent the SCP from being notified of an unnecessary amount of location changes as a result of this, a time controller ~~can~~ also can be incorporated in the MT: the MS divulges the location information and/or location changes no earlier than after a settable time period, but immediately once this time period has elapsed.

- 15       Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.



Abstract

ABSTRACT OF THE DISCLOSURE

A Mmethod for monitoring the position of a mobile communication terminal for location dependent telecommunication services and an active voice connection, wherein to To guarantee that the telecommunication service works correctly during a call, the position of the terminal in question needs to be checked not only when the connection is set up but also for the entire time of the connection. If, such that if a change of position is established, the telecommunication service then needs to be changed in a corresponding manner by the service center.

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Figure 1

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